National Weather Service Milwaukee

Spotter Training Class
2017

#skywarn17

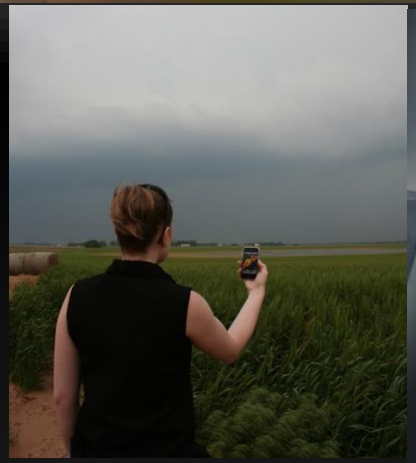
Video: Skip Talbot

What is a storm spotter?

The National Weather Service needs reports of tornadoes, flash flooding, wind damage, and hail size to effectively warn the public of inclement weather.

Storm Spotter volunteers provide ground truth to what NWS meteorologists interpret on radar. They typically have an interest in the weather and a desire to serve their community.

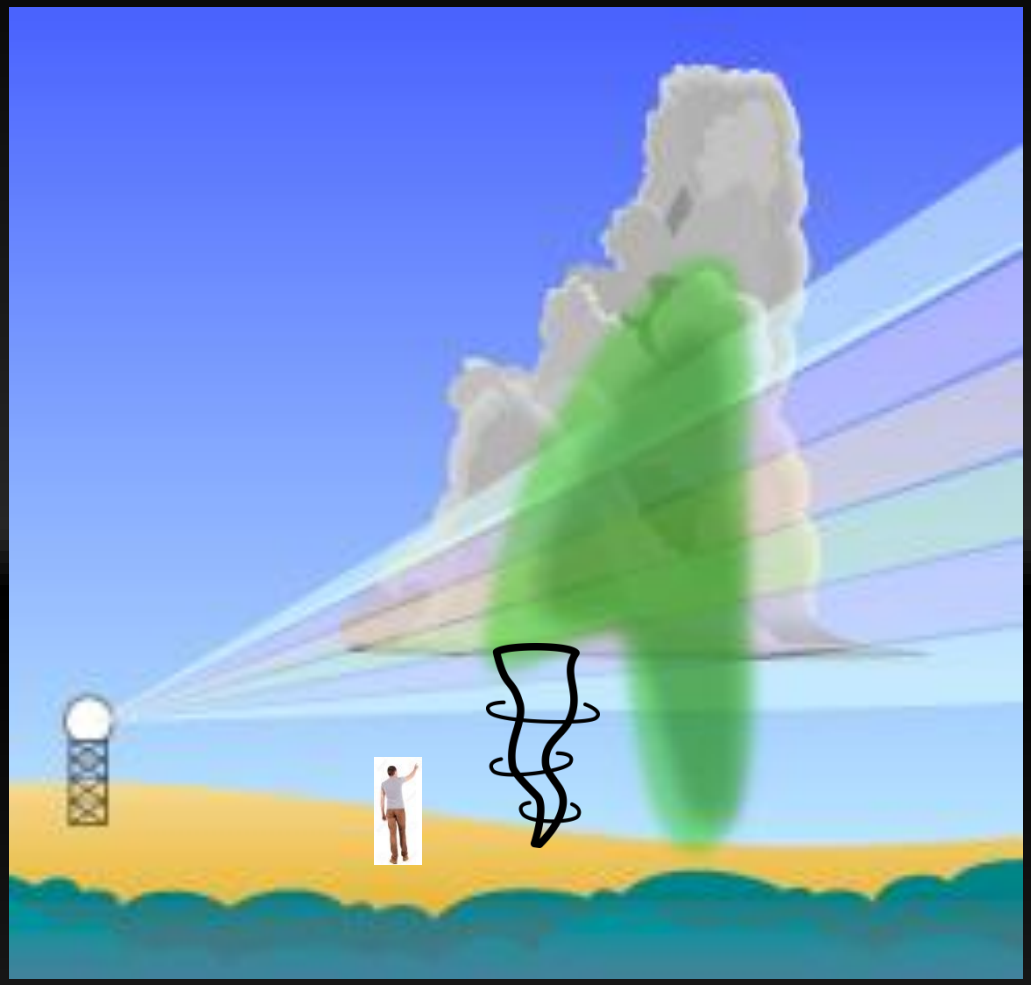
Who are storm spotters?



-Law enforcement
-Fire personnel
-EMS workers
-Public utility
-Amateur Radio volunteers
-Private citizens
(Hospitals, schools, churches, nursing homes, others w/responsibility for protecting others.)

Radar Limitations

NWS Milwaukee Doppler Radar



Spotters provide "Ground Truth".

Radar typically doesn't 'see' tornado.

How do spotters help?

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SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE MILWAUKEE/SULLIVAN WI
531 PM CDT THU AUG 18 2005

WIC021-025-049-111-182315-
/O.CON.KMKX.TO.W.0029.000000T0000Z-050818T2315Z/
COLUMBIA-SAUK-IOWA-DANE-
531 PM CDT THU AUG 18 2005

...A TORNADO WARNING CONTINUES UNTIL 615 PM CDT FOR DANE...IOWA...
SAUK AND COLUMBIA COUNTIES...

AT 527 PM CDT...TRAINED WEATHER SPOTTERS REPORTED A LINE OF TORNADO
PRODUCING STORMS.  THESE TORNADO PRODUCING STORMS WERE LOCATED ALONG
A LINE EXTENDING FROM 6 MILES NORTH OF BARABOO TO NEAR SPRING
GREEN...MOVING EAST AT 50 MPH.

TORNADO PRODUCING STORMS WILL BE NEAR...
  MIDDLETON...LODI AND DANE BY 540 PM CDT...
  WAUNAKEE...SHOREWOOD HILLS...POYNETTE AND MADISON BY 545 PM CDT...
  TOKEN CREEK...MORRISONVILLE AND WINDSOR BY 550 PM CDT...

TRAINED SPOTTERS REPORTED A TORNADO NEAR SPRING GREEN AT 525
PM...AND ANOTHER TORNADO NEAR COUNTY HIGHWAY C IN SAUK COUNTY...EAST
OF LELAND.

DO NOT USE YOUR CAR TO TRY TO OUTRUN A TORNADO. CARS ARE EASILY
TOSSED AROUND BY TORNADO WINDS. IF YOU ARE CAUGHT IN THE PATH OF A
TORNADO...LEAVE THE CAR AND GO TO A STRONG BUILDING. IF NO SAFE
STRUCTURE IS NEARBY...SEEK SHELTER IN A DITCH OR LOW SPOT AND COVER
YOUR HEAD.

A TORNADO WATCH REMAINS IN EFFECT UNTIL 900 PM CDT THURSDAY EVENING
FOR SOUTH CENTRAL WISCONSIN.

LAT...LON 4351 8999 4316 9009 4297 8901 4334 8903

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SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE MILWAUKEE/SULLIVAN WI
620 PM CDT THU AUG 18 2005

WIC021-025-182345-
/O.CON.KMKX.TO.W.0031.000000T0000Z-050818T2345Z/
COLUMBIA-DANE-
620 PM CDT THU AUG 18 2005

...A TORNADO WARNING CONTINUES UNTIL 645 PM CDT FOR DANE AND COLUMBIA
COUNTIES...

AT 615 PM CDT...TRAINED WEATHER SPOTTERS REPORTED A TORNADO.  THIS
TORNADO WAS LOCATED IN FITCHBURG...MOVING EAST NORTHEAST AT 30 MPH.

THE TORNADO WILL BE NEAR...
  MONONA BY 635 PM CDT...

AT 622 PM CDT...HAMS REPORTED A TORNADO 3 NORTH OF DANE...AND
ANOTHER TORNADO 3 MILES NORTH OF LODI. THESE TORNADOES WERE MOVING
EAST-NORTHEAST. DEFOREST IS IN THE PATH OF THE DANE TORNADO.

A TORNADO WATCH REMAINS IN EFFECT UNTIL 900 PM CDT THURSDAY EVENING
FOR SOUTH CENTRAL WISCONSIN. A TORNADO WATCH ALSO REMAINS IN EFFECT
UNTIL 1100 PM CDT THURSDAY EVENING FOR SOUTHEASTERN WISCONSIN.

LAT...LON 4342 8958 4312 8962 4310 8902 4342 8900

$$
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People react to reports of tornadoes!

Real Time Reports

Reports that come in as the storm is in progress are much more valuable than post-storm reports.

NWS relays this information through warnings.

Broadcast media can relay over the air.

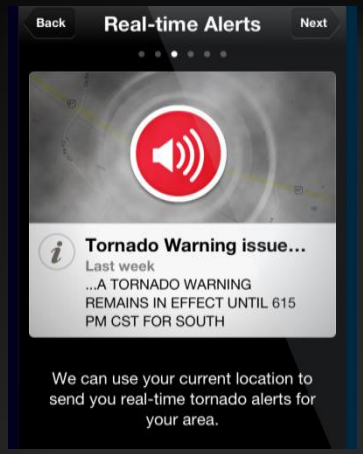
People react!

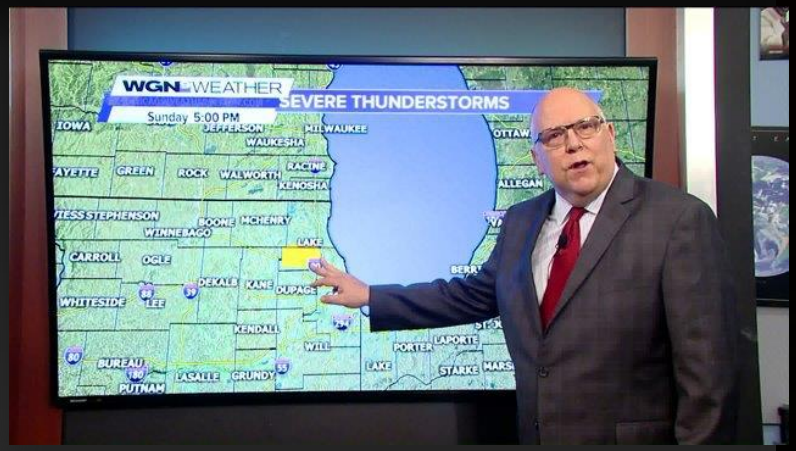
What triggers a warning?

Typically need 2 out of 3 of these to issue a warning.

Less reliant on spotter reports at night.

How do spotters help?





All Hazards NOAA Weather Radio
NOAA's National Weather Service

Your report could be the reason the NWS issues a Tornado Warning & someone seeks shelter.

National Weather Service Milwaukee/Sullivan

Storm Spotting Process

Training

Hour 1: Severe Weather Safety

Prepare

Deploy

Observe

Communicate

Storm Spotting Process

Training

Prepare

Deploy

Observe

Communicate

Storm Spotting Process

Training

Prepare

Deploy

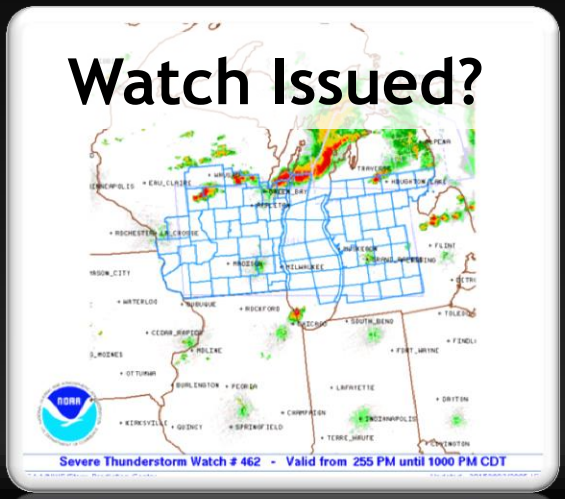
Observe

Communicate

Deploy

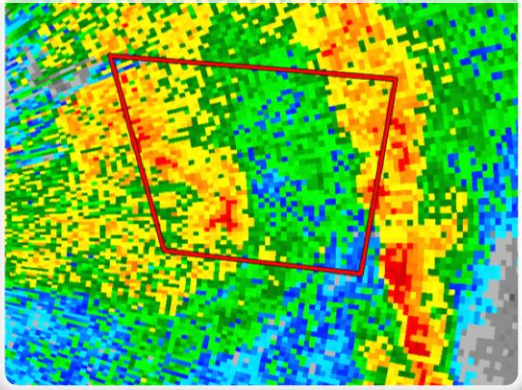
When should you go out to look at storms?

Watch Issued?



Too Early?

Warning Issued?

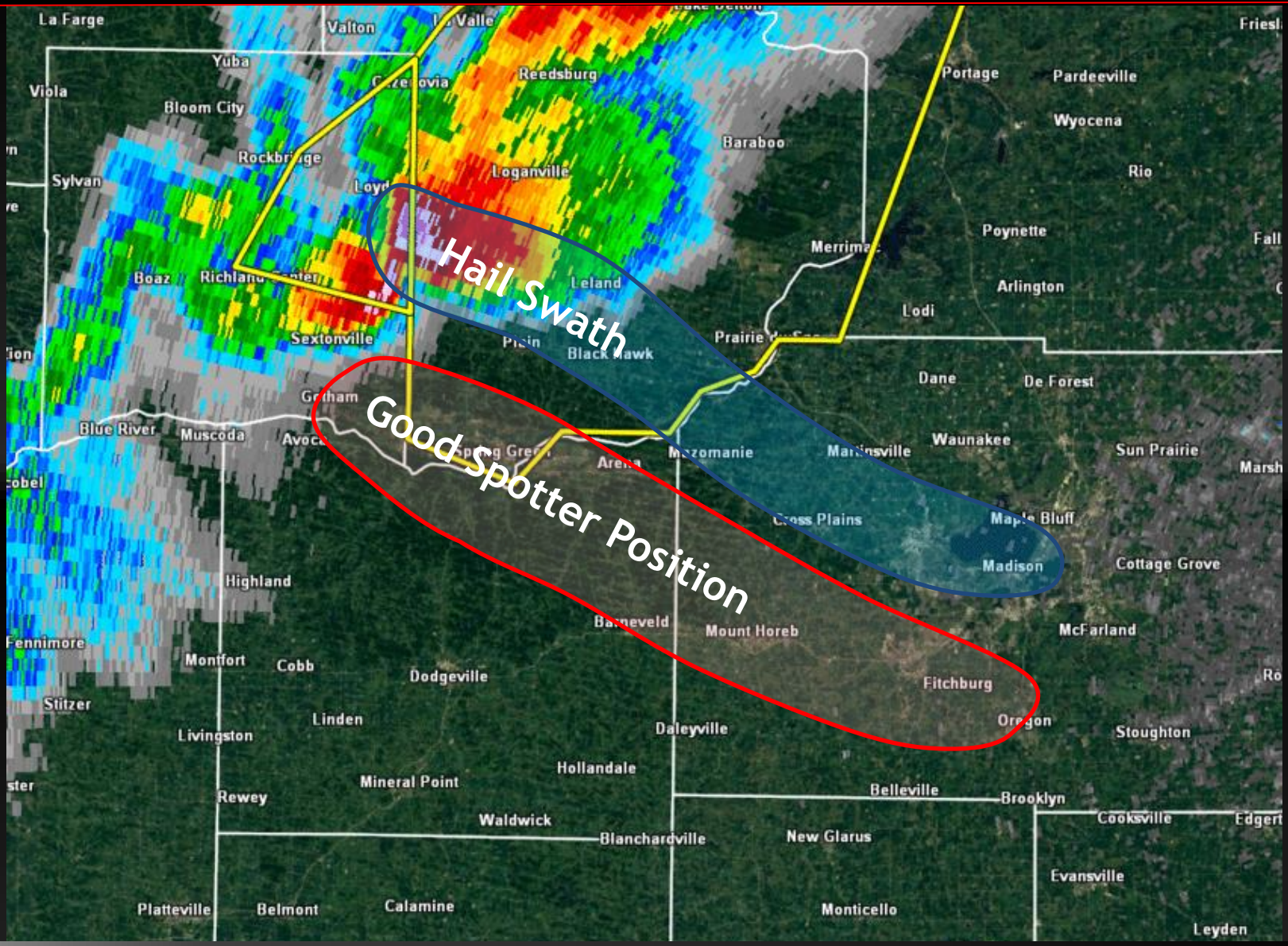


Too Late?

Spotting Locations

- Stationary or Mobile.
- Upstream from city.
- Good visibility.
  - High Ground.
  - No trees.
- Escape routes.

September 19th, 2016 Supercell



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Self Activating

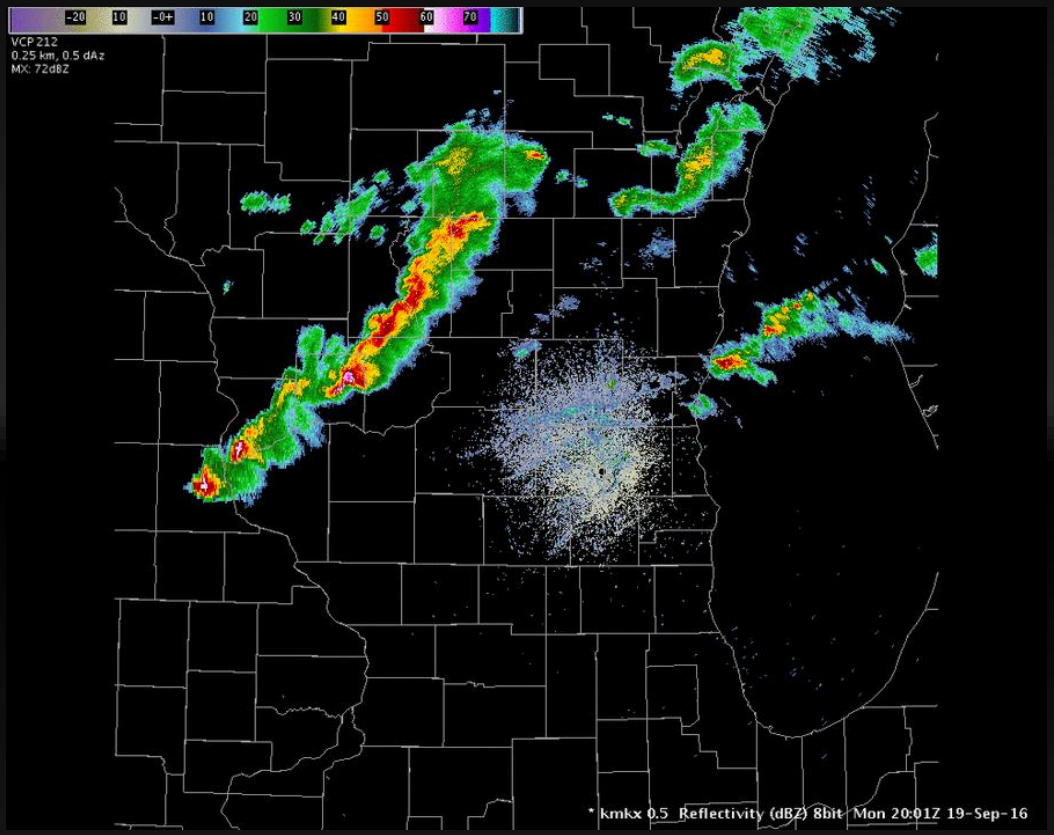
-Stay ahead of storms.

-Monitor conditions in nearby counties.

-Monitor radar trends.

-Be pro-active!

-May not see anything.



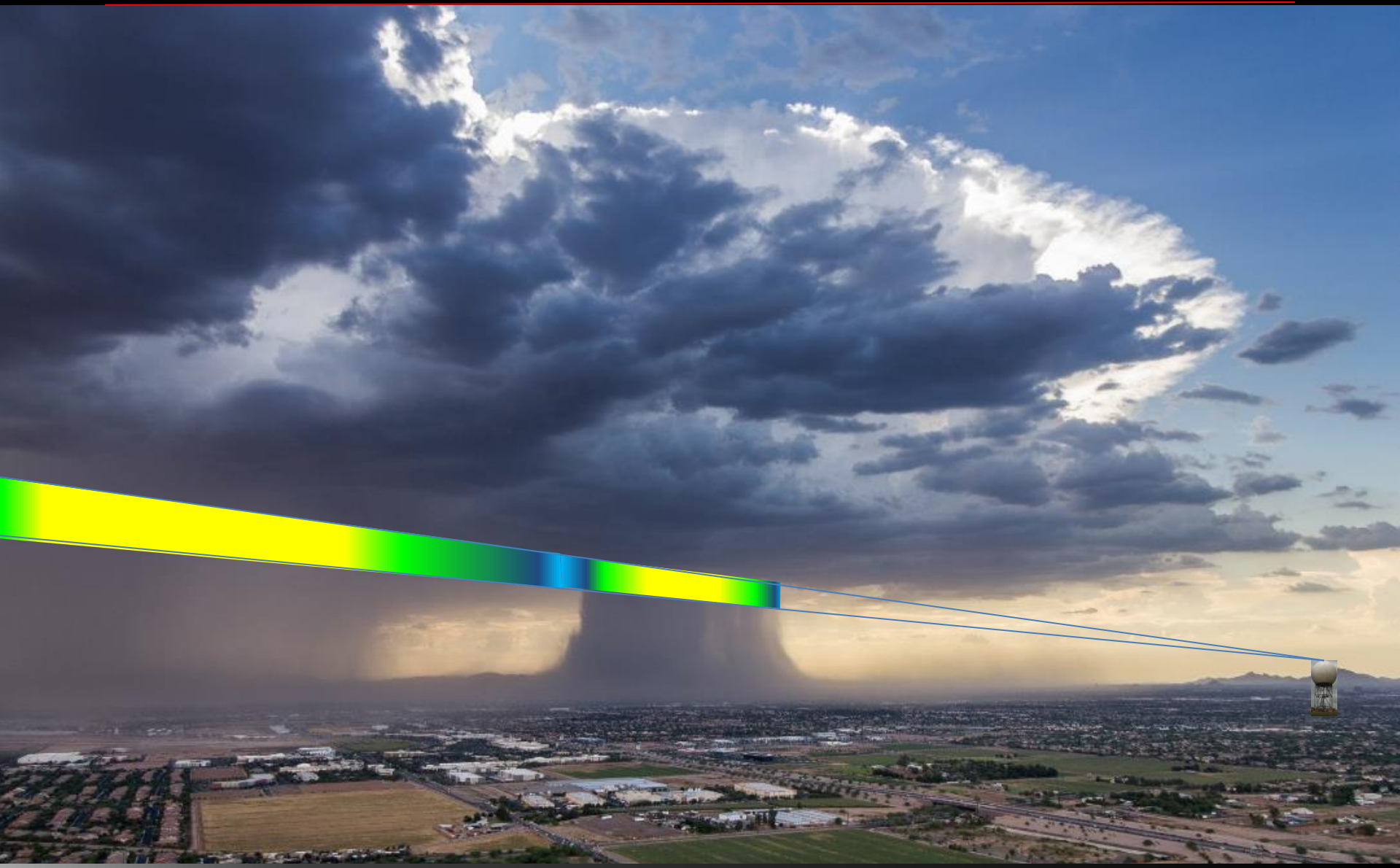
Doppler Radar

RAdio Detection And Ranging

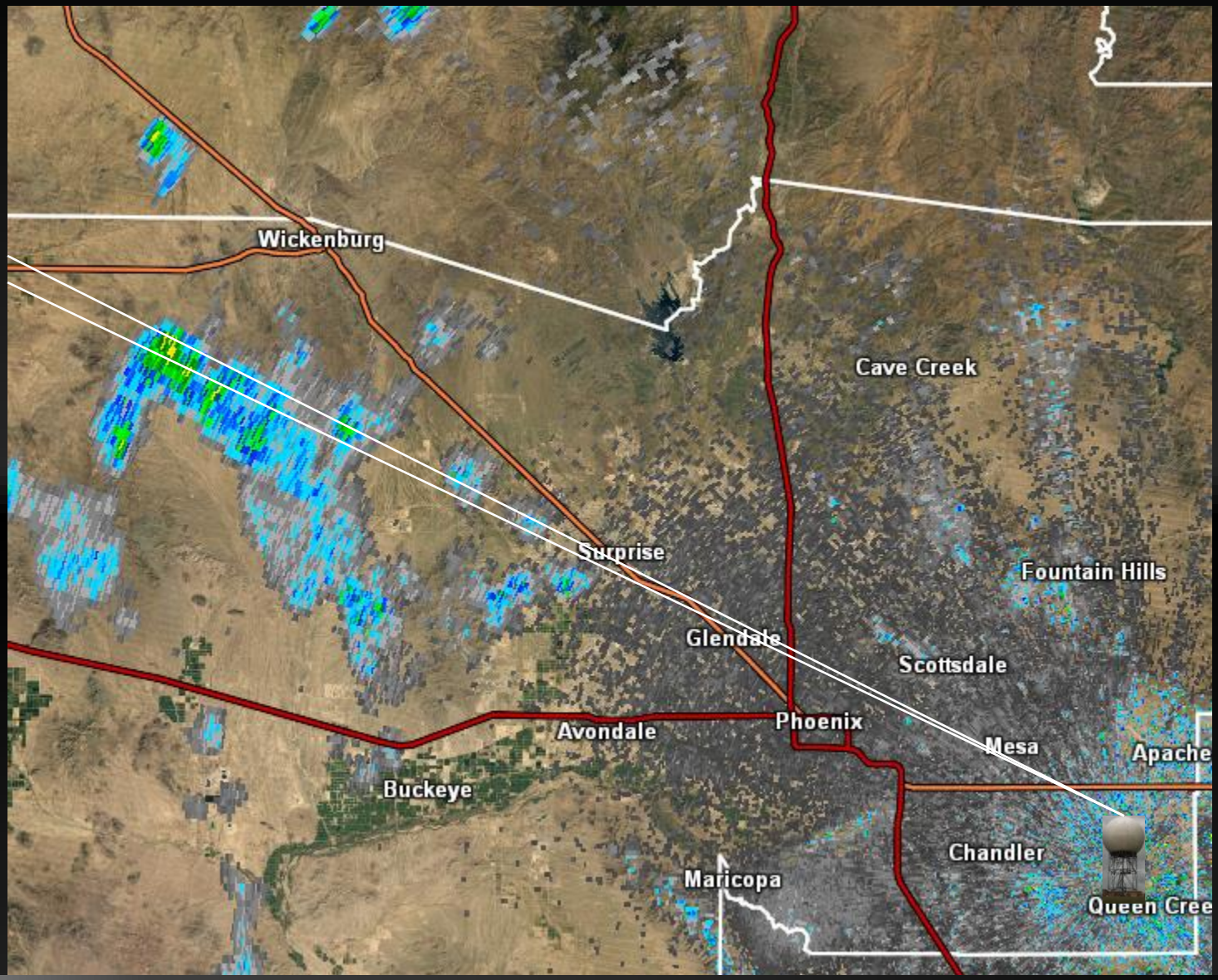
- Prototype radar built in 1988
- Weather Surveillance Radar-1988 Doppler (WSR-88D)

What you see...

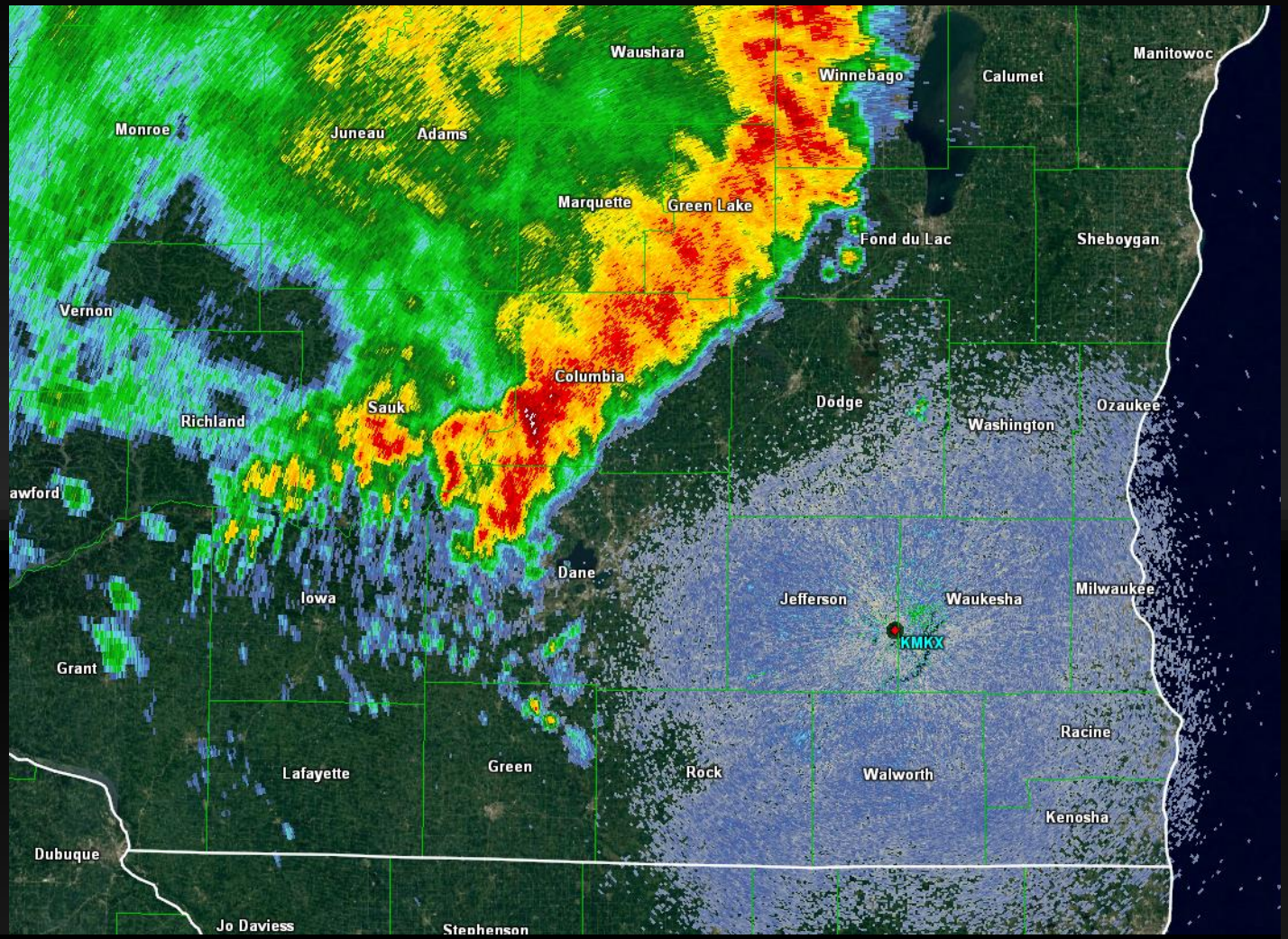
What radar “sees”…

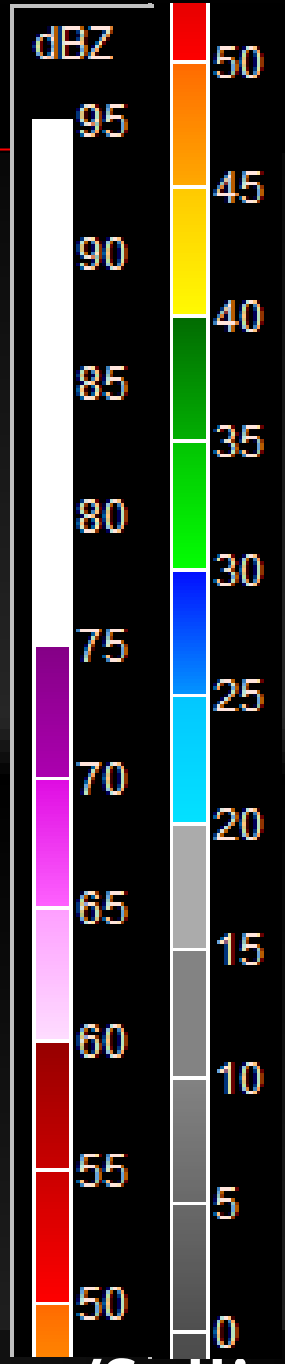


What radar “sees”…



Reflectivity





Check the scale you're using.

Higher reflectivity(dBZ) = More rain drops/hail

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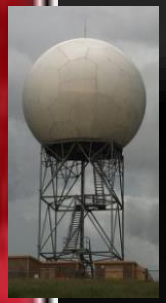
Doppler Effect-Velocity

Red: Moving away from radar

Green: Moving toward radar



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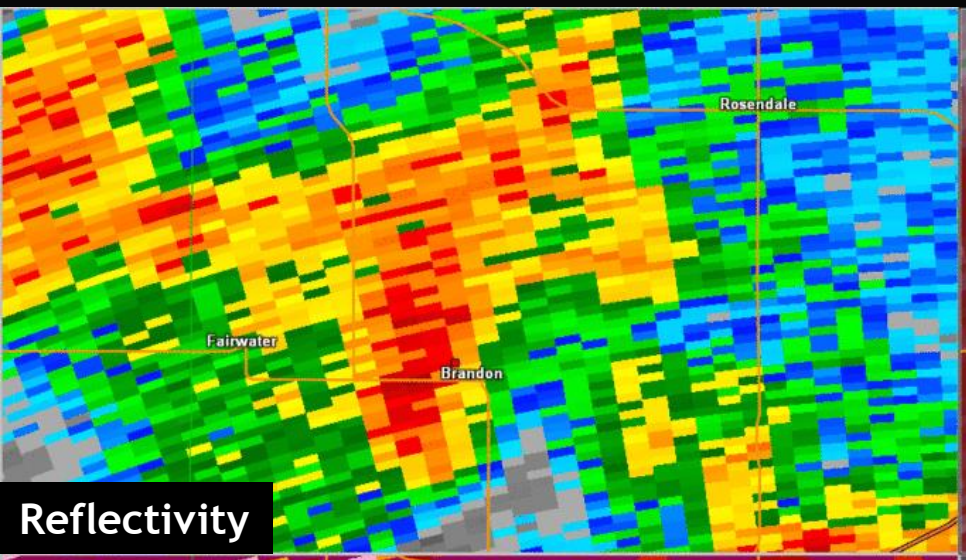
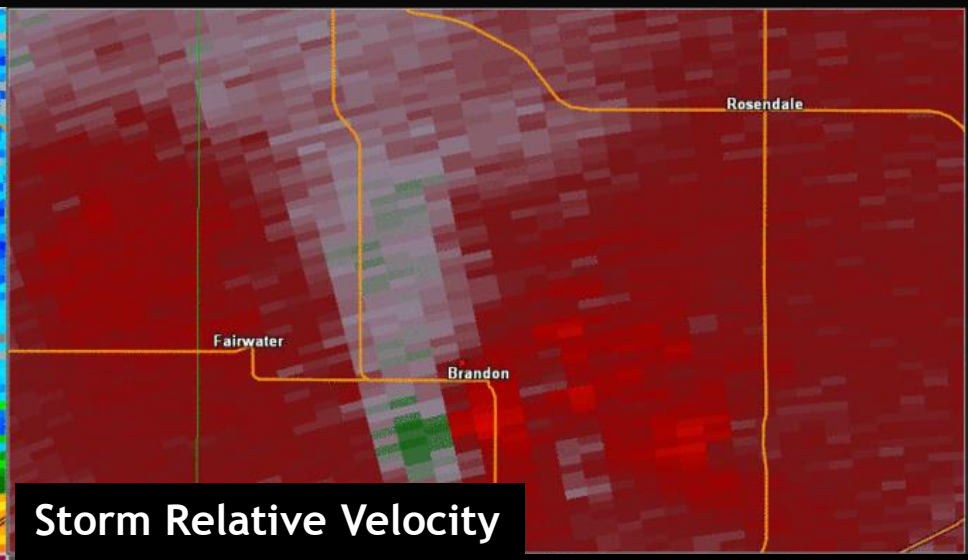
Tornado Debris Signature



Reflectivity

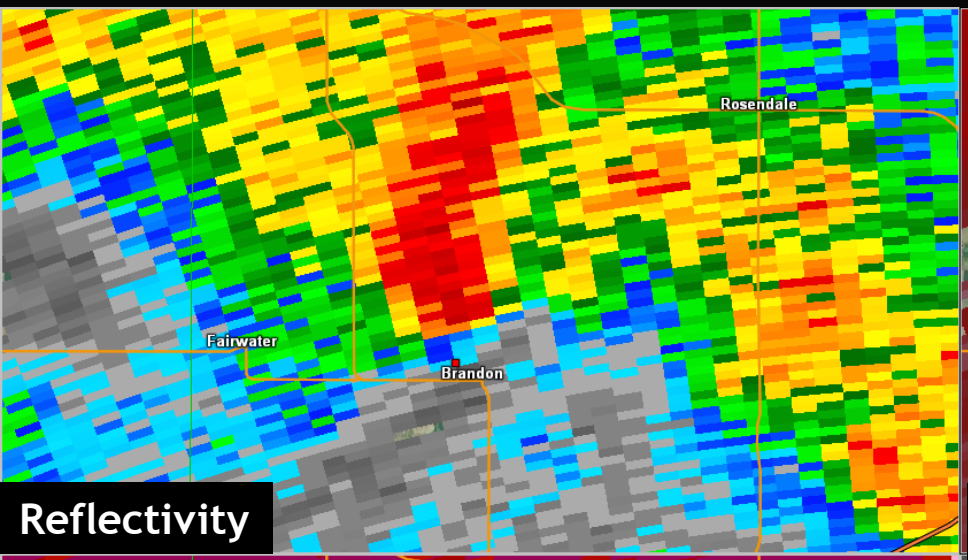


Storm Relative Velocity

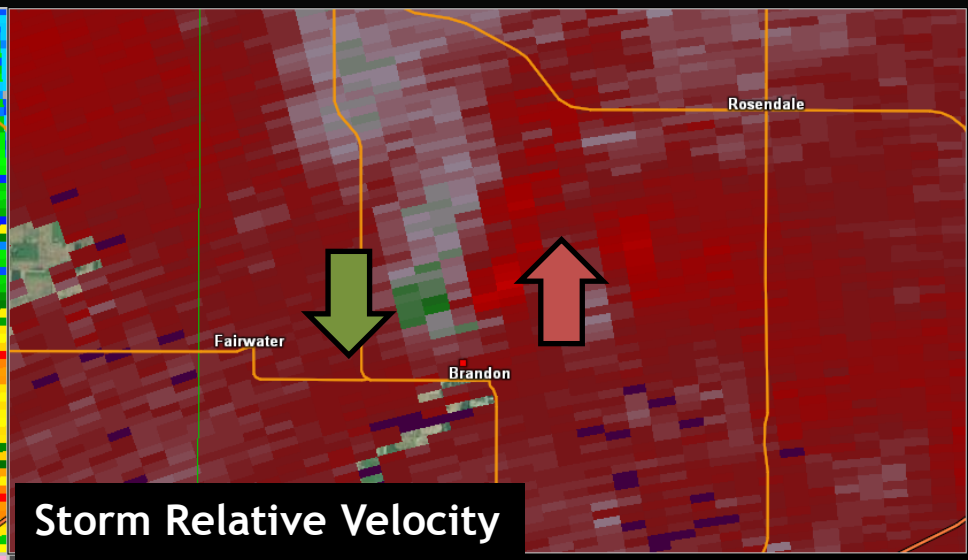
Correlation Coefficient

Brandon (FDL County) EF1 Tornado
May 27, 2016

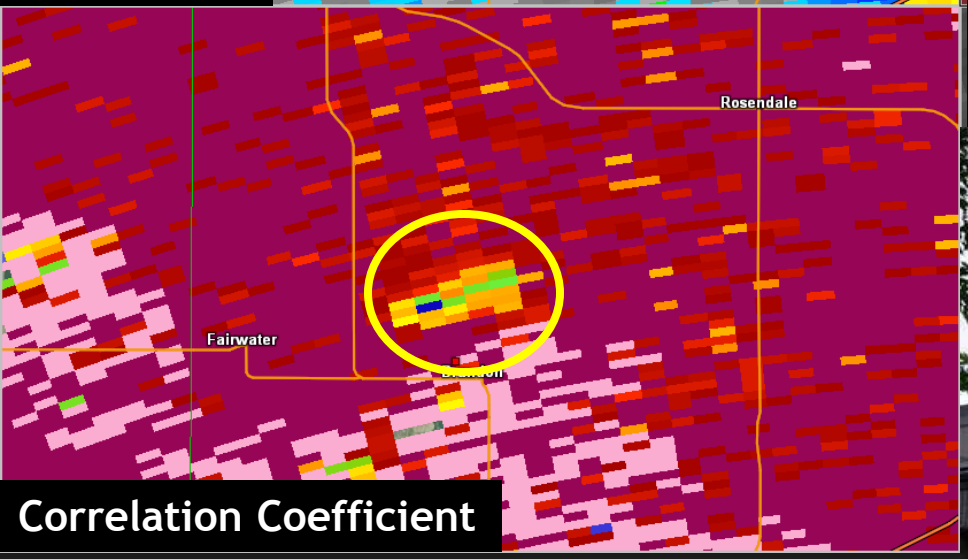
Tornado Debris Signature



Reflectivity



Storm Relative Velocity

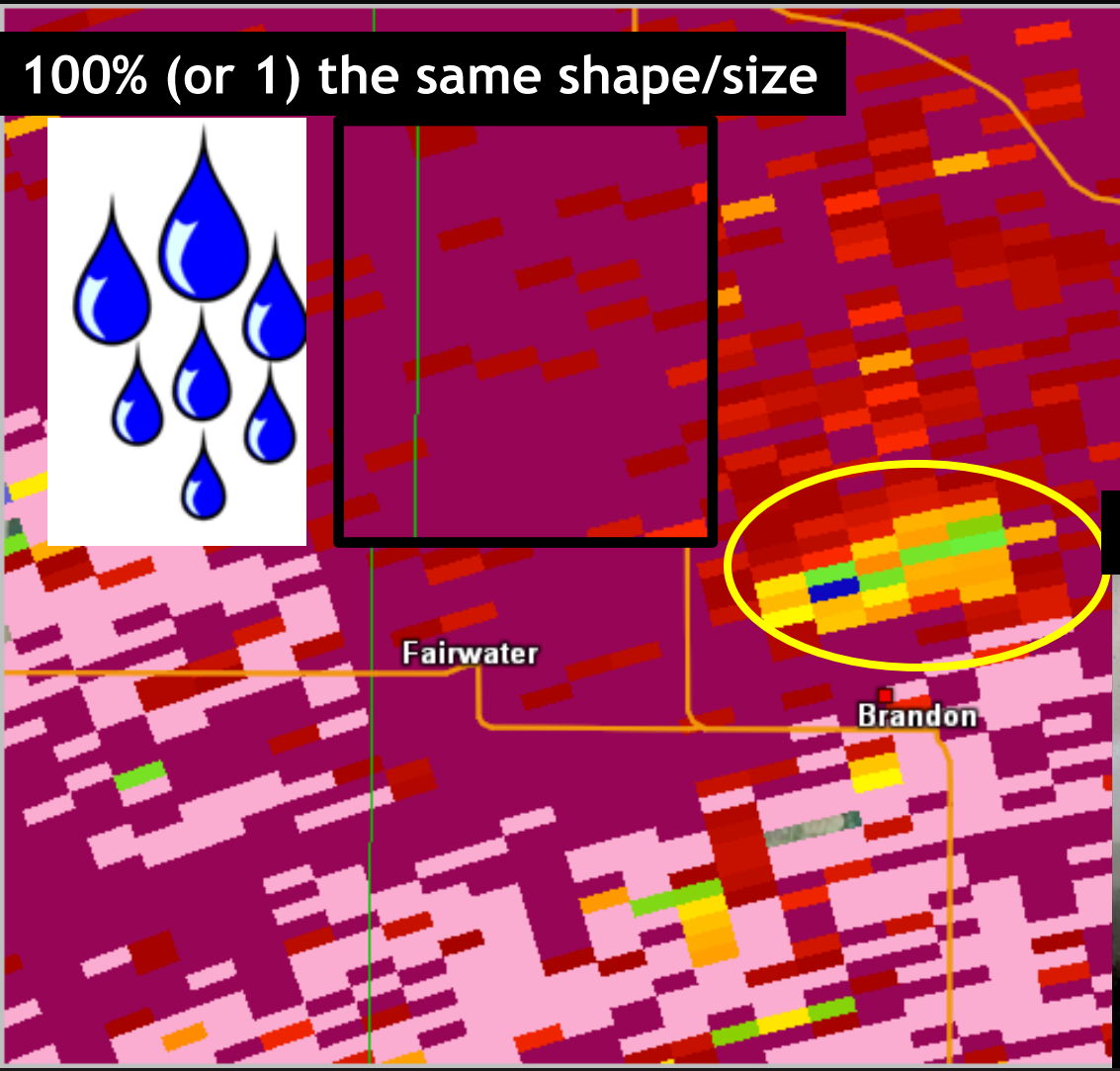


Correlation Coefficient

Brandon (FDL County) EF1 Tornado
May 27, 2016

National Weather Service Milwaukee/Sullivan

Correlation Coefficient



50-90% : Not same shape/size

Storm Spotting Process

Training

Prepare

Deploy

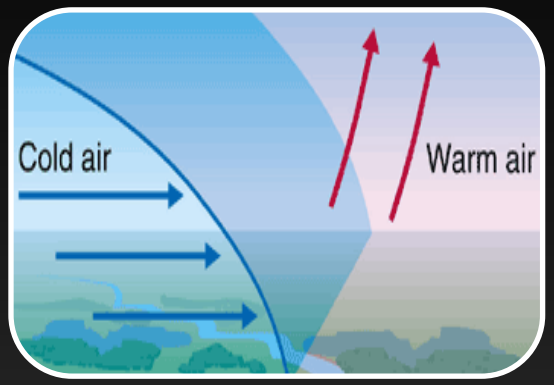
Observe

Communicate

Thunderstorm Ingredients

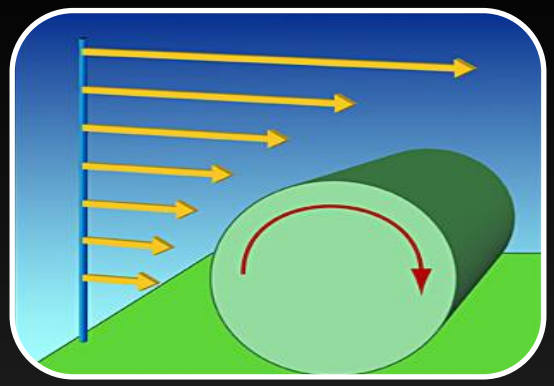
Moisture

Instability



Lift

BONUS:
For Severe Weather



Wind Shear

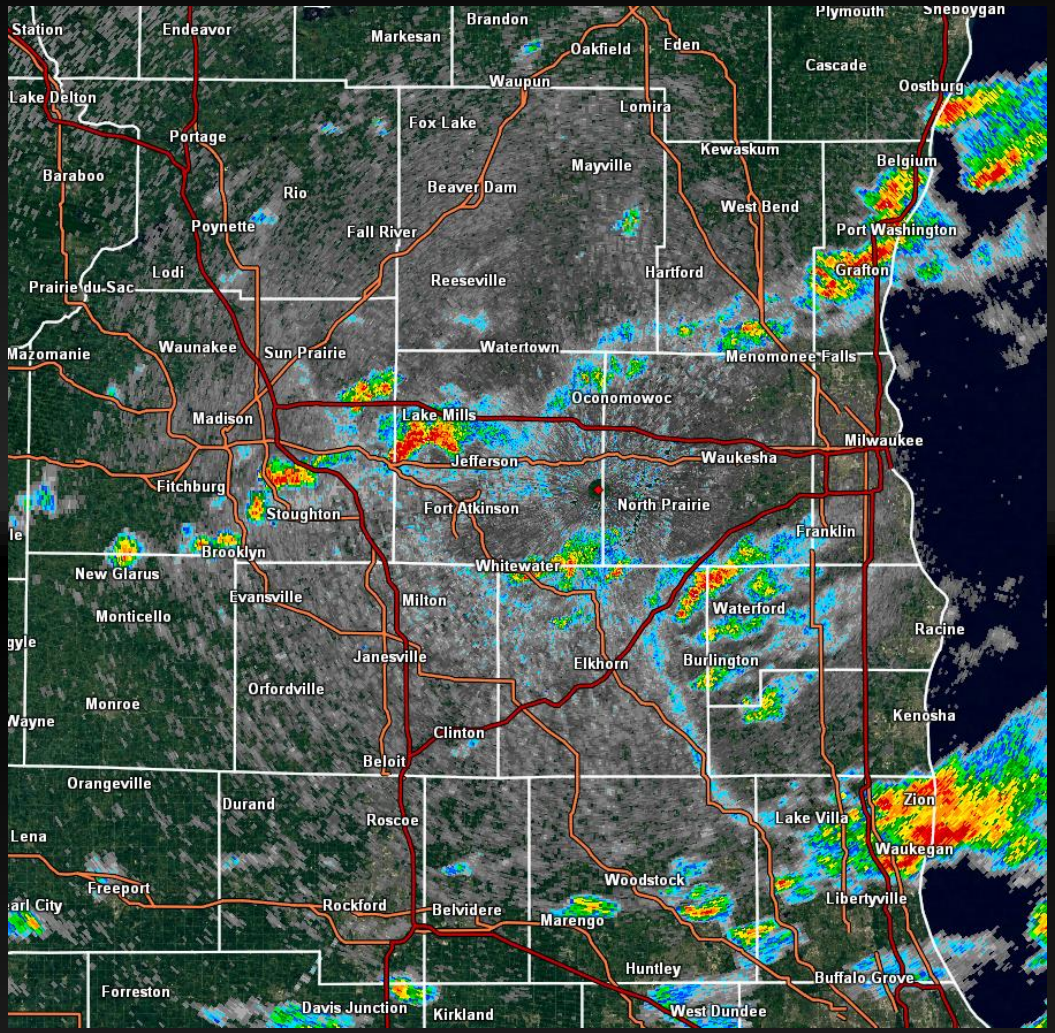
Storm Types and Features

Single Cell	Multicell Cluster or Line	Supercell

Little to none.	Low → Higher

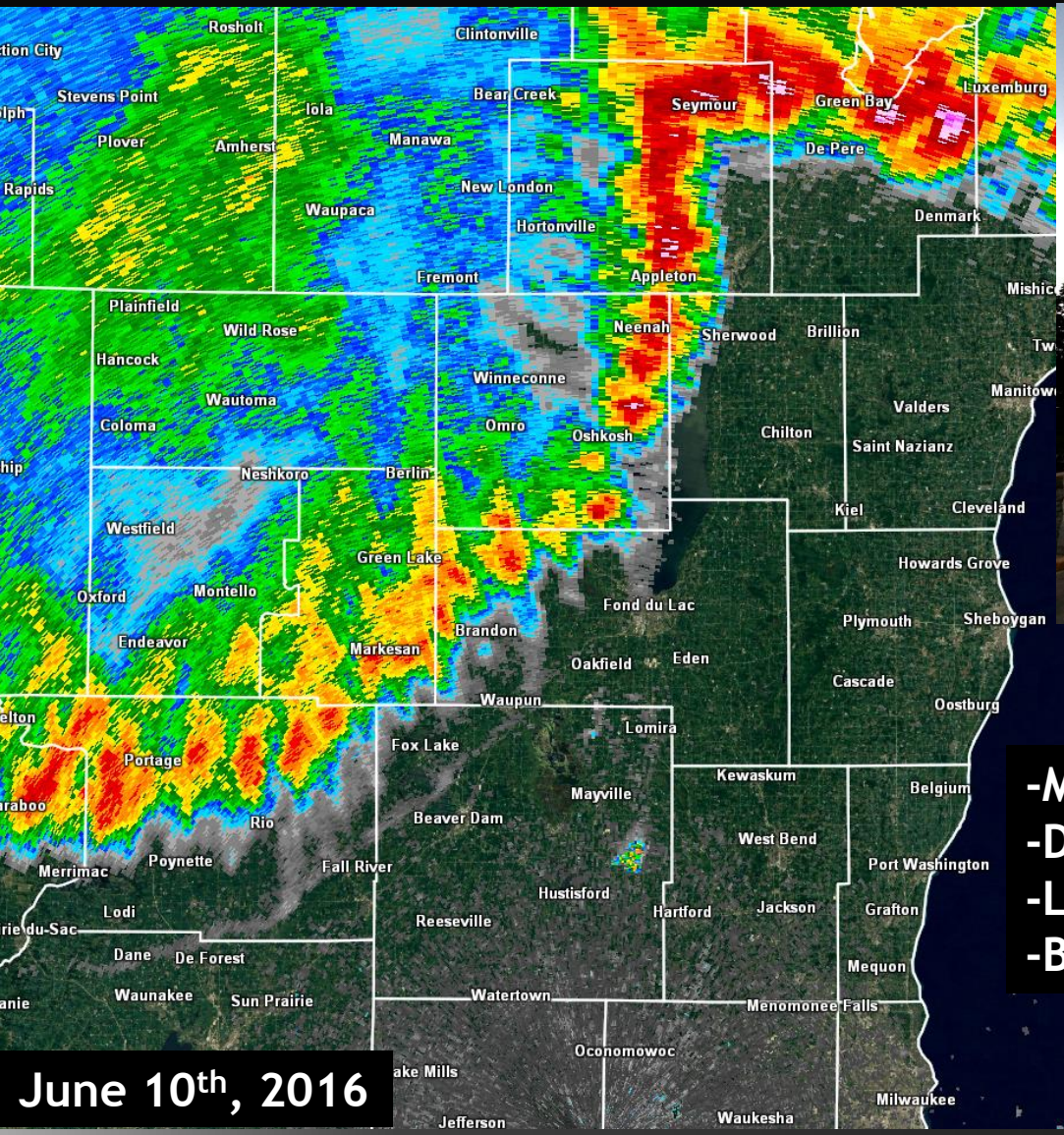
WIND SHEAR

Single Cell Storms



-Short lived. (30-45 min)
-Little, if any, severe weather.
-Small hail.
-Gusty winds. (<70mph)
-Brief, weak tornadoes possible.

Multicell Cluster/Squall Line Storms



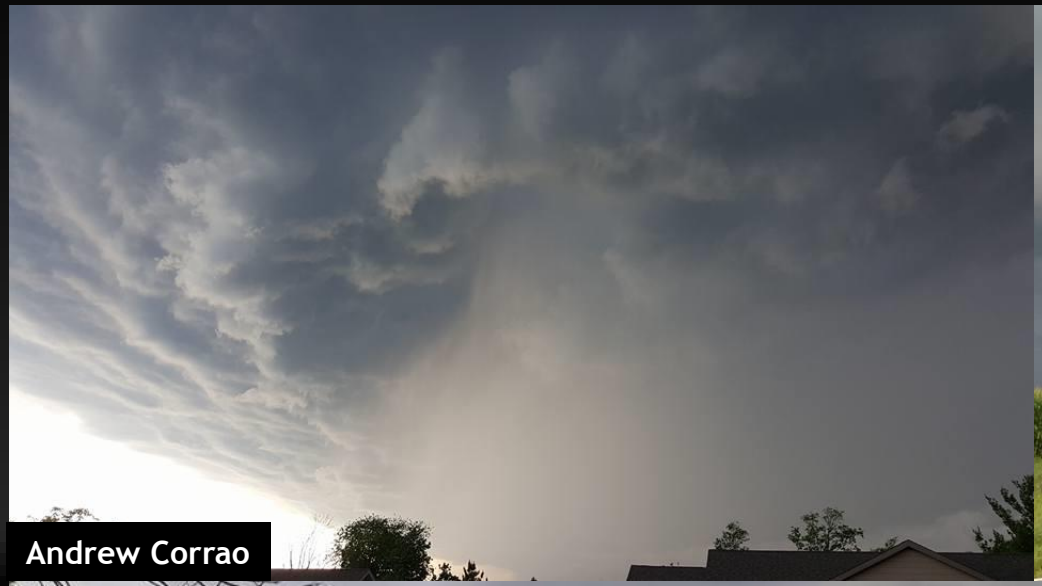
Fond du Lac
Walleye Weekend
Doug Raflik

-Most common severe weather.
-Damaging winds. (Downburst)
-Large hail. (Small-Moderate)
-Brief, weak to strong tornadoes.

June 10th, 2016

National Weather Service Milwaukee/Sullivan

Shelf Cloud: No need to report

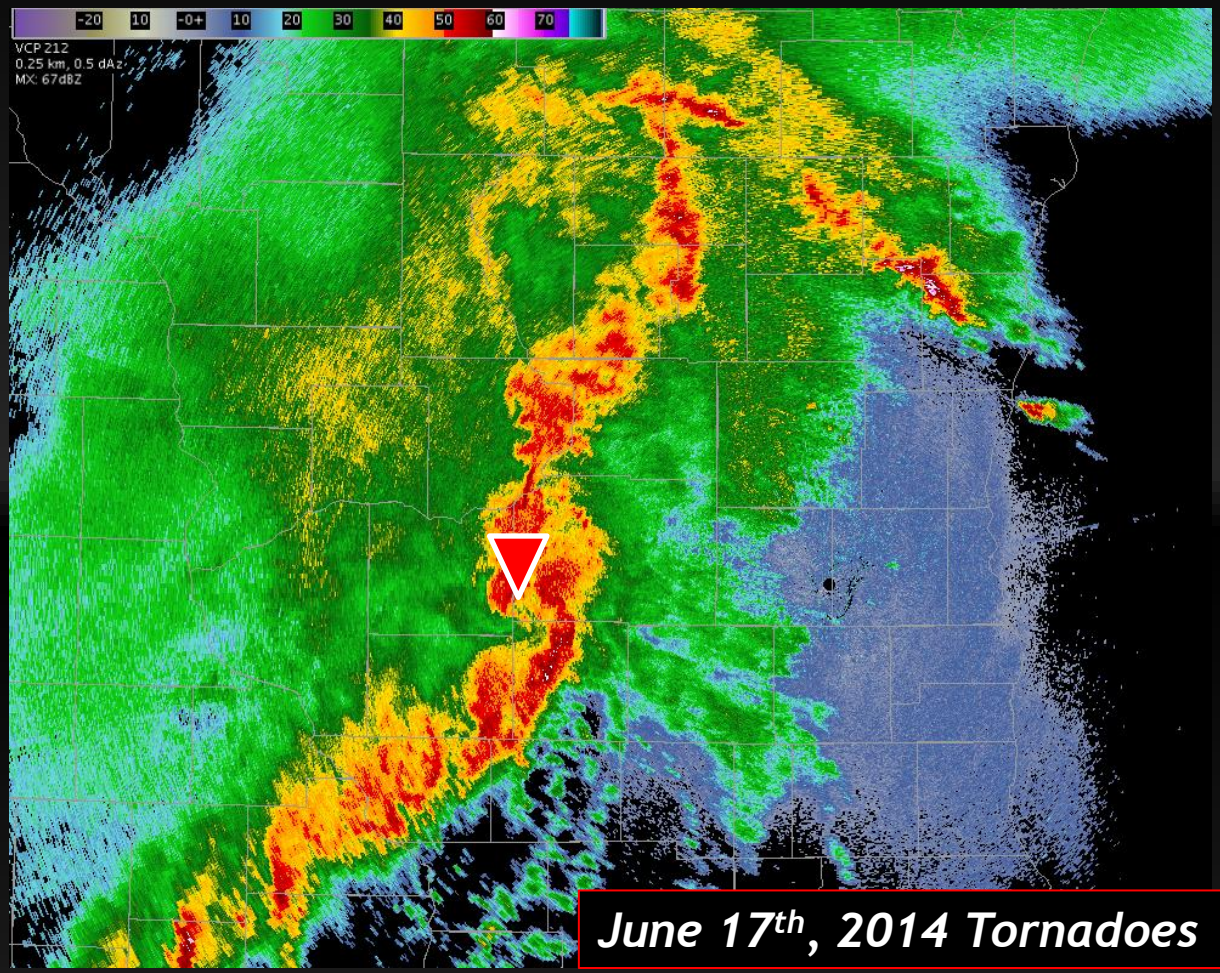

Andrew Corrao


Rob Concklin


Vicki Niemczyk

National Weather Service Milwaukee/Sullivan

Squall Line Tornadoes



June 17th, 2014 Tornadoes

-Brief, weak to strong tornadoes.

-Difficult to impossible to view.

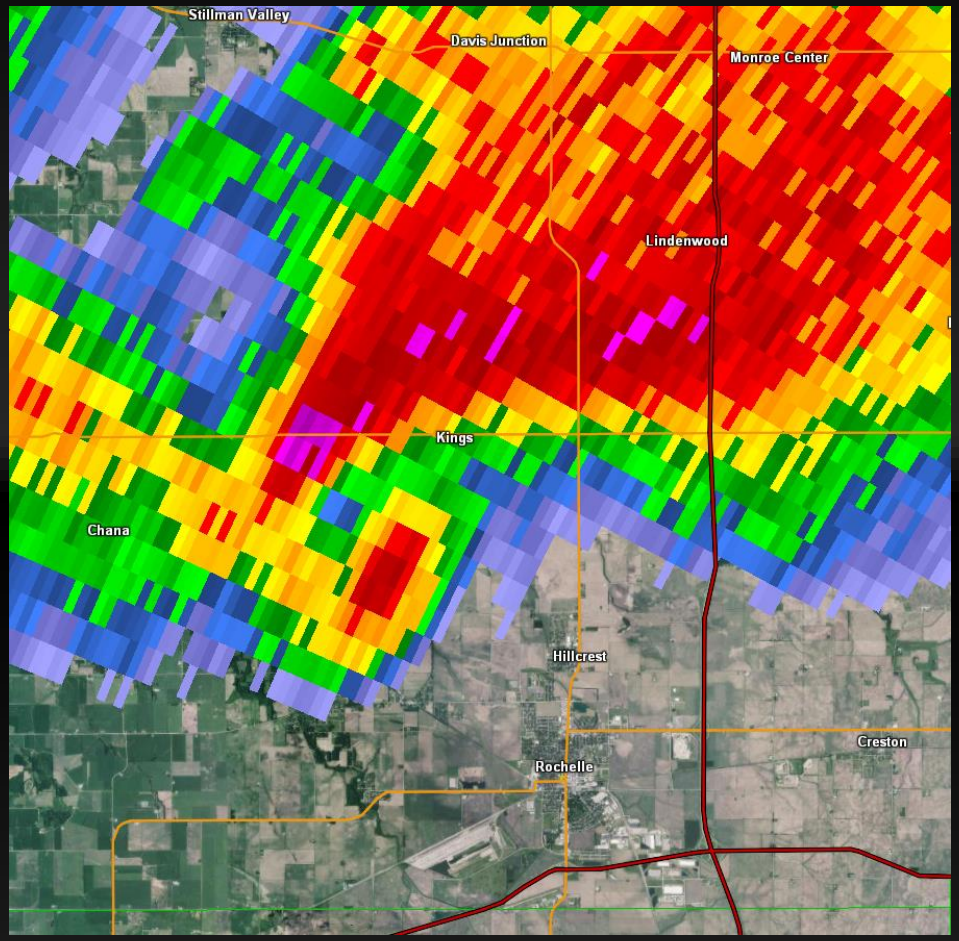
-Fast moving.

-Embedded within heavy rainfall.

-Typically occur at night.

-Do not try to spot!

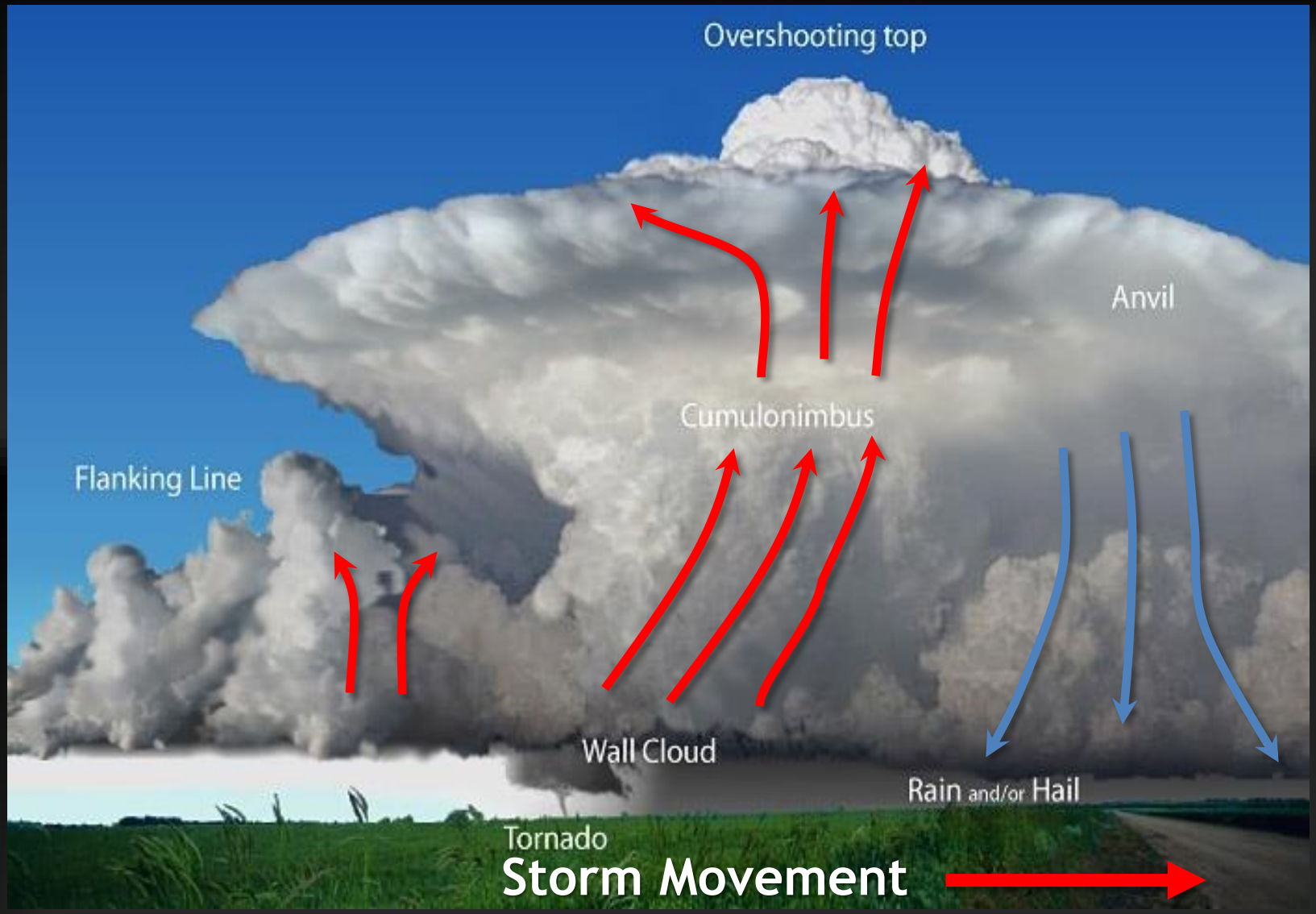
Supercell Thunderstorms



Tom Purdy

-Strong, long living storm.
-Tornadoes. (Long track)
-Damaging winds. (Downburst)
-Large hail.

Supercell Thunderstorms

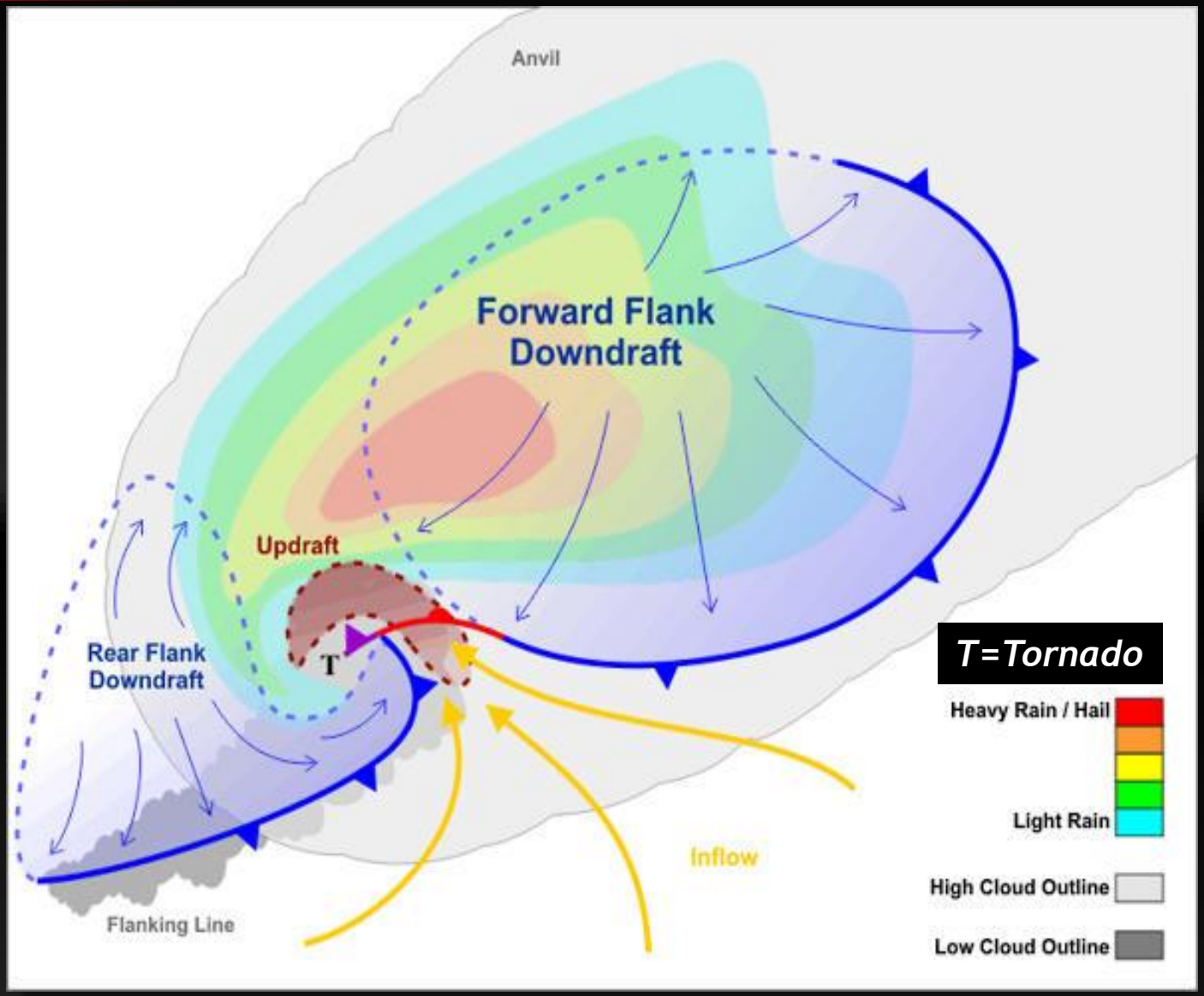


Supercell Thunderstorms

Doug Raflik
Waupun

National Weather Service Milwaukee/Sullivan

Supercell Thunderstorms



Wall Cloud

- Isolated lowering.
- Rear of storm.
- Updraft area. (up and in)
- Persistent feature?
- Watch for rotation.
- Reportable to NWS.
- **NOTE:**
  - Movement does not equal rotation.
  - Having a wall cloud does not mean a tornado will form.


Tyler Schiller
Horicon


Chris Keske
Horicon

Wall Cloud

Jesse Ritka-WTMJ 4
Waupun

Funnel Cloud

Cassie Perkins
Sun Prairie

Garrett Latsch
Sun Prairie

Scott Wagner
Sun Prairie

Rotation at base of cloud.
Reportable to NWS.

*May not trigger a
Tornado Warning

Tornadoes

While reporting of wind damage, hail, flash flooding are important for the NWS to know of as soon as possible, spotters add the most value with their spotting of tornado formation and prompt reporting directly to the NWS.

Tornado Behavior

- Typically change direction, intensity and speed over life cycle

Rain Wrapped Tornado

Watch for Debris!

Nighttime Tornadoes

Brett Adair
Pontiac, IL

Night Spotting

CAUTION!

- Spotting storms at night can be dangerous!

- Need to be experienced and have radar support!

- Lightning.
- Transformers/Power lines.
  - Bright flashes.
- Roaring sound.
  - Tornado.
  - High Wind.

Tornado Look-a-likes: Virga

Tornado Look-a-likes: Rain Shaft

Tornado Look-a-likes: Scud Cloud

Mike Jones
Mt. Pleasant

Kirsahn Mitchell
Kenosha

Geoff Grace
Kenosha/Racine

Tornado Look-a-likes: Scud Cloud

Storm Spotting Process

Training

Prepare

Deploy

Observe

Communicate

Communication

- The MOST Important step in process!
- Reports must get to the NWS!
- Do not assume we know just because a warning is out.

Communication

Reporting Basics

- Who are you?
  - Trained spotter, law enforcement, etc
- What occurred?
- When was it?
- Where was it?
- Use proper terms
- Be as specific as you can
- Estimate if needed
- How confident are you?
- Location should be an address/lat-lon/intersection
  - Can be miles from city, if unsure
- Follow up, if necessary

Communication

NWS Milwaukee Spotter Phone

1-800-545-8197

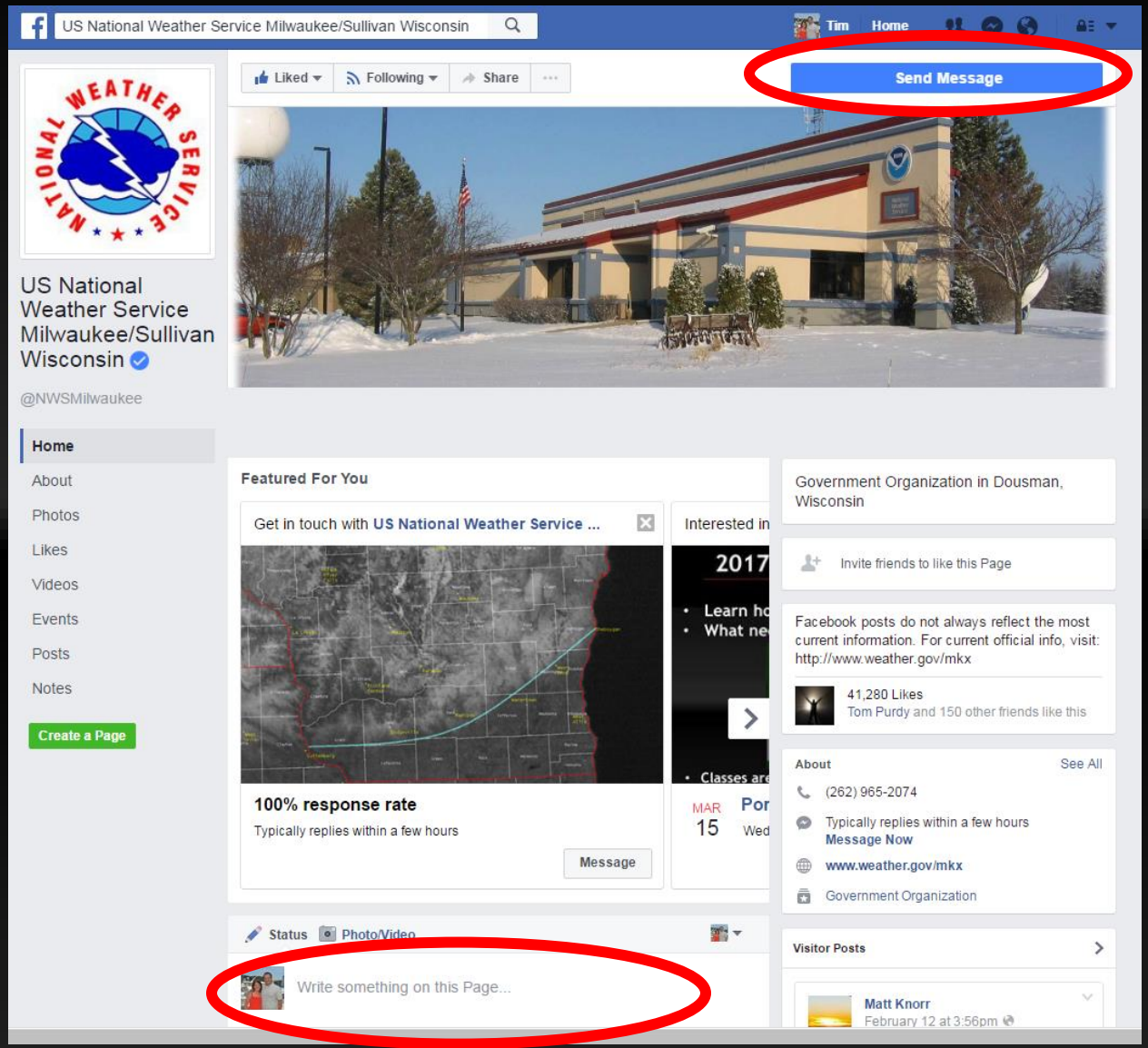
Reports only!

- **Highest Priority:**
- Tornado
- Flash flooding
  - Roads washed out/closed
- Structural Damage-Winds
- Uprooted trees-Winds
- Hail over 2” in diameter

Twitter @NWSMKX

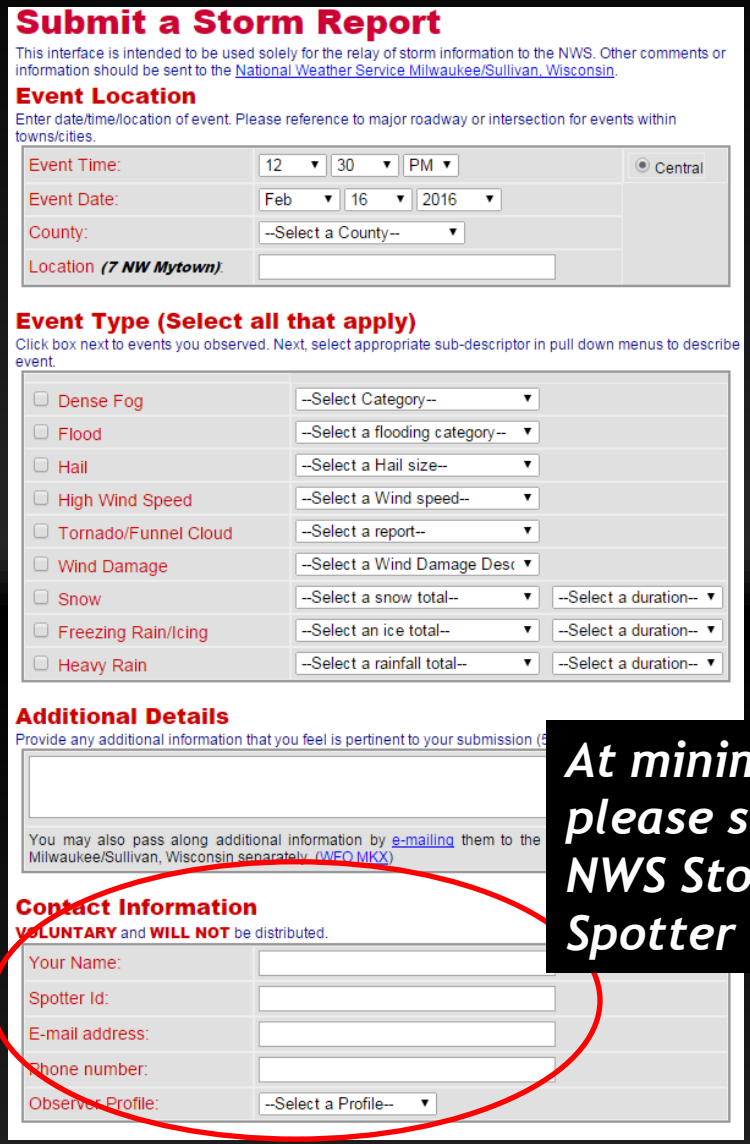
- **Best way to send reports/pictures to NWS Milwaukee via social media**
- **Photos are great!**
- **Mention @NWSMKX and we receive an audible alert on our computer.**
- **#swiwx okay, but report may be missed**
- **We are always monitoring, but call if a high priority event**
- **More info posted from us here during storms.**

facebook.com/NWSMilwaukee



- **Photos are great!**
- **Send a message (BEST), write a post on the page or a post from us.**
- **We are monitoring, but call if a high priority event.**
- **More forecast information posted by us before storms occur.**

weather.gov/mkx/reports

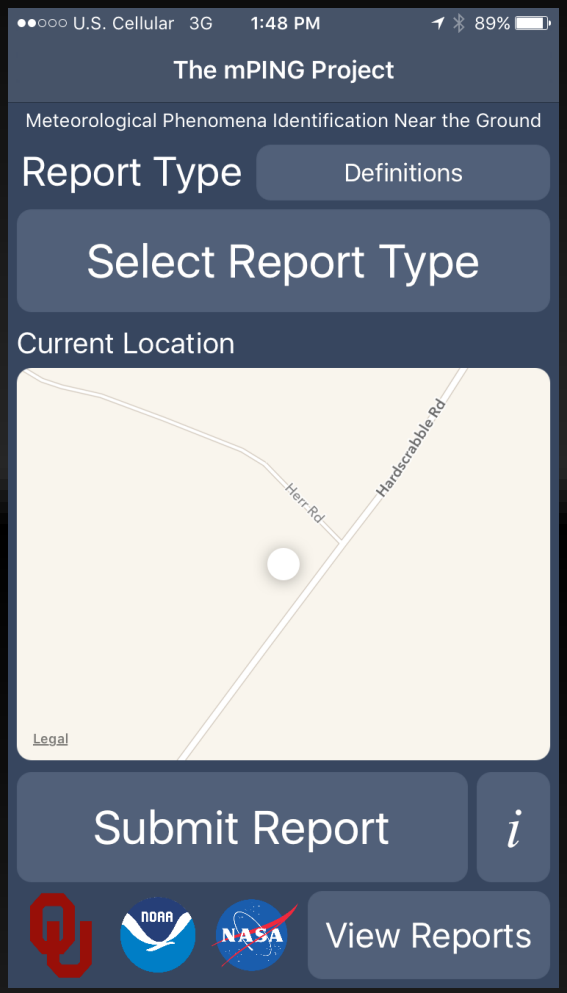


At minimum, please select NWS Storm Spotter

Amateur Radio

Columbia County ARES/RACES Richard Green: kc9fnm@gmail.com Tyler Letlebo: tletlebo@gmail.com	**Dane County Midwest SSTRC** Dale Bernstein: dale.bernstein@midwestsstrc.org	**Dodge County ARES/RACES** Ryan Klavekoske: ryantiff@charter.net	**Fond du Lac County** Sullivan Committee webmaster@sulcom.info
Green County Sullivan Committee webmaster@sulcom.info	**Green Lake County** Sullivan Committee webmaster@sulcom.info	**Iowa County ARES/RACES** Brad Holcomb: brad.sulcom@brokennexus.com Dale Bernstein: dale.bernstein@midwestsstrc.org	**Jefferson County ARES/RACES** Paul Marowsky: paul@marowsky.com
Kenosha County Racine Co ARES/RACES Dave Whitham: vacuumtube.guru@gmail.com	**Lafayette County** Sullivan Committee webmaster@sulcom.info	**Marquette County ARES/RACES** Gary Sorensen: garyso@maqs.net	**Milwaukee County Milwaukee Area Skywarn Association** Skip Voros: svoros@execpc.com
Ozaukee County OZARES ARES/RACES Don Zank: d_zank@yahoo.com	**Racine County ARES/RACES** Dave Whitham: vacuumtube.guru@gmail.com	**Rock County Midwest SSTRC** Dale Bernstein: dale.bernstein@midwestsstrc.org	**Sauk County ARES/RACES** Matt Noll: kc9upe@gmail.com
Sheboygan County OZARES/Washington County ARES/RACES	**Walworth County Weather Spotters** Chad Anderson: k9cma71@gmail.com Eli Larson: k9ilj.wx@gmail.com	**Washington County ARES/RACES** Steve Sundquist: realsnow@hotmail.com	**Waukesha County MASA** Skip Voros: svoros@execpc.com

mPING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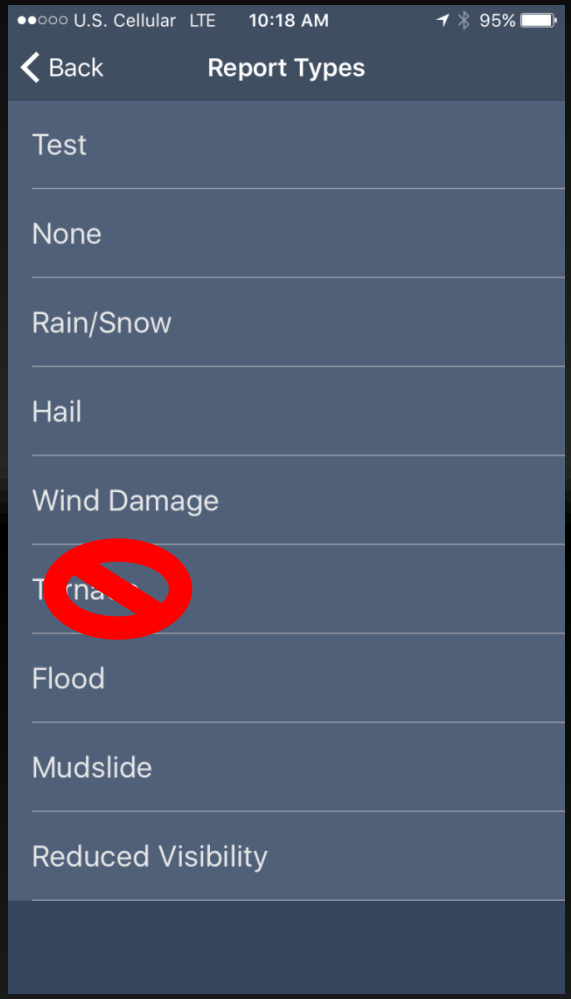
The mPING Project
Meteorological Phenomena Identification Near the Ground
Report Type
Definitions
Select Report Type
Current Location
Herr Rd
Hardscrabble Rd
Legal
Submit Report
i
NOAA
NASA
View Reports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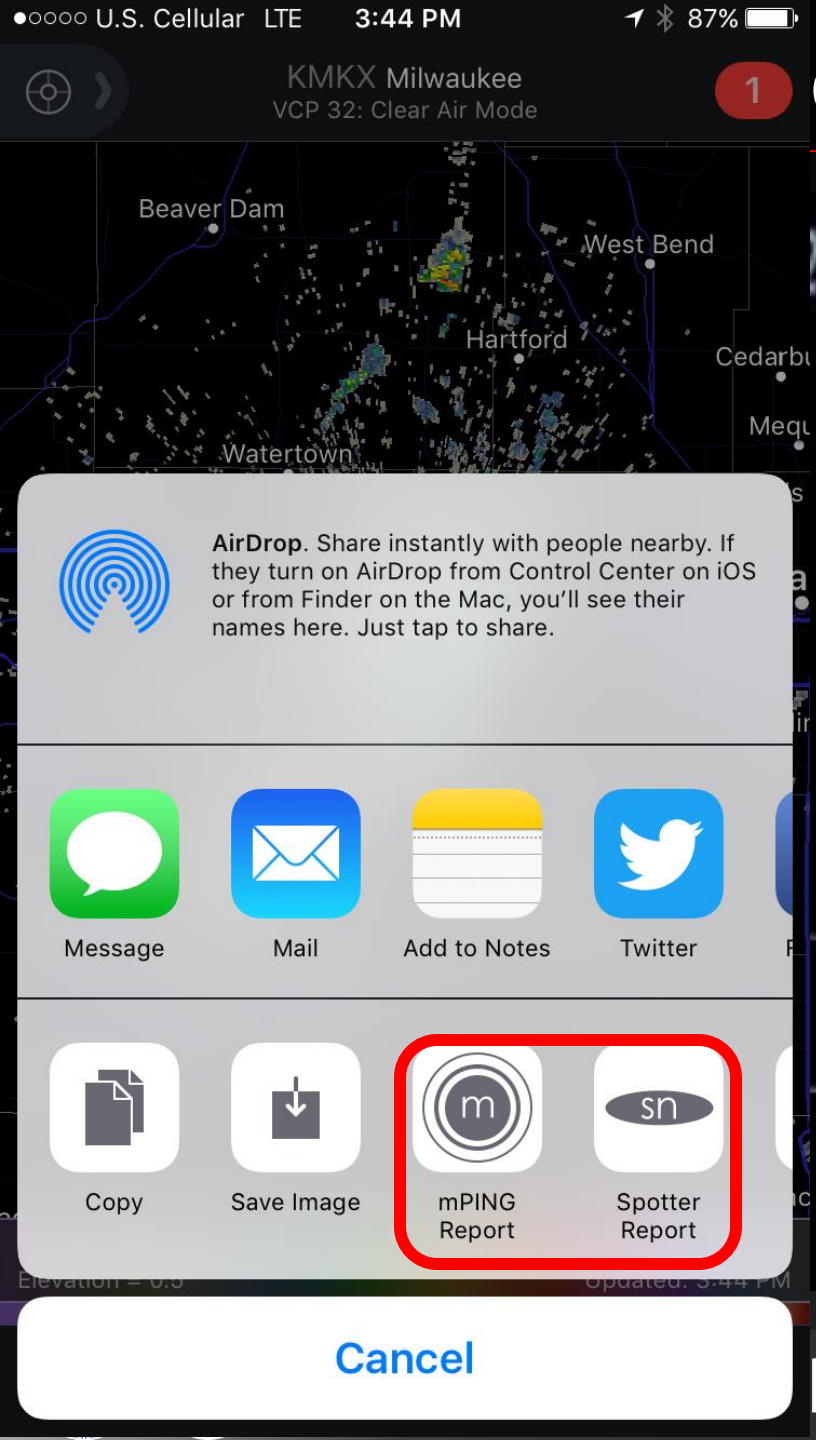
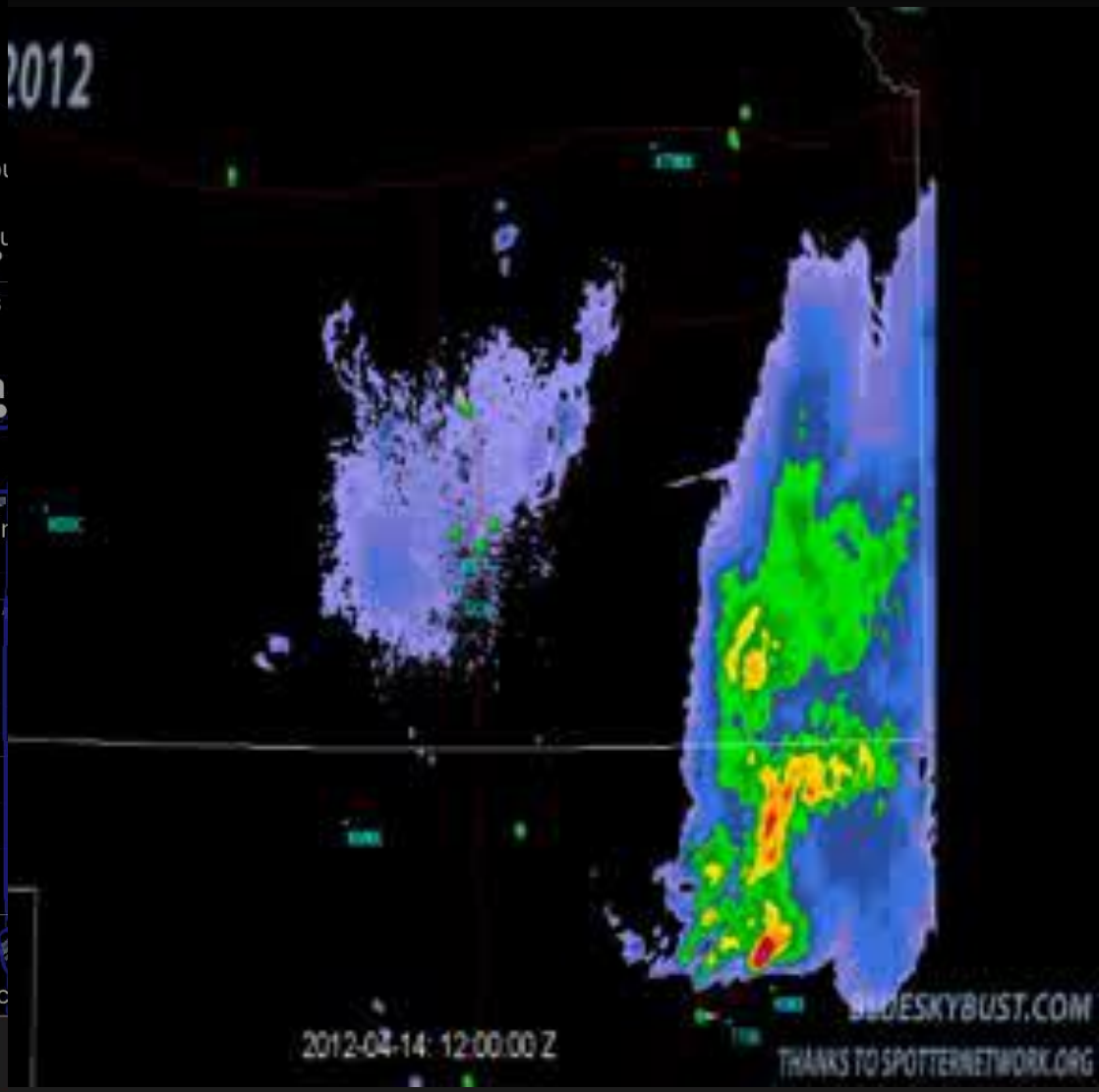
Back
Report Types
Test
None
Rain/Snow
Hail
Wind Damage
Flood
Mudslide
Reduced Visibility


●●○○○ U.S. Cellular LTE 10:18 AM 95%
Report Types
Report Types
Pea (0.25 in.)
Half-inch (0.50 in.)
Dime (0.75 in.)
Quarter (1.00 in.)
Half Dollar (1.25 in.)
Ping Pong Ball (1.50 in.)
Golf Ball (1.75 in.)
Hen Egg (2.00 in.)
Hen Egg+ (2.25 in.)
Tennis Ball (2.50 in.)



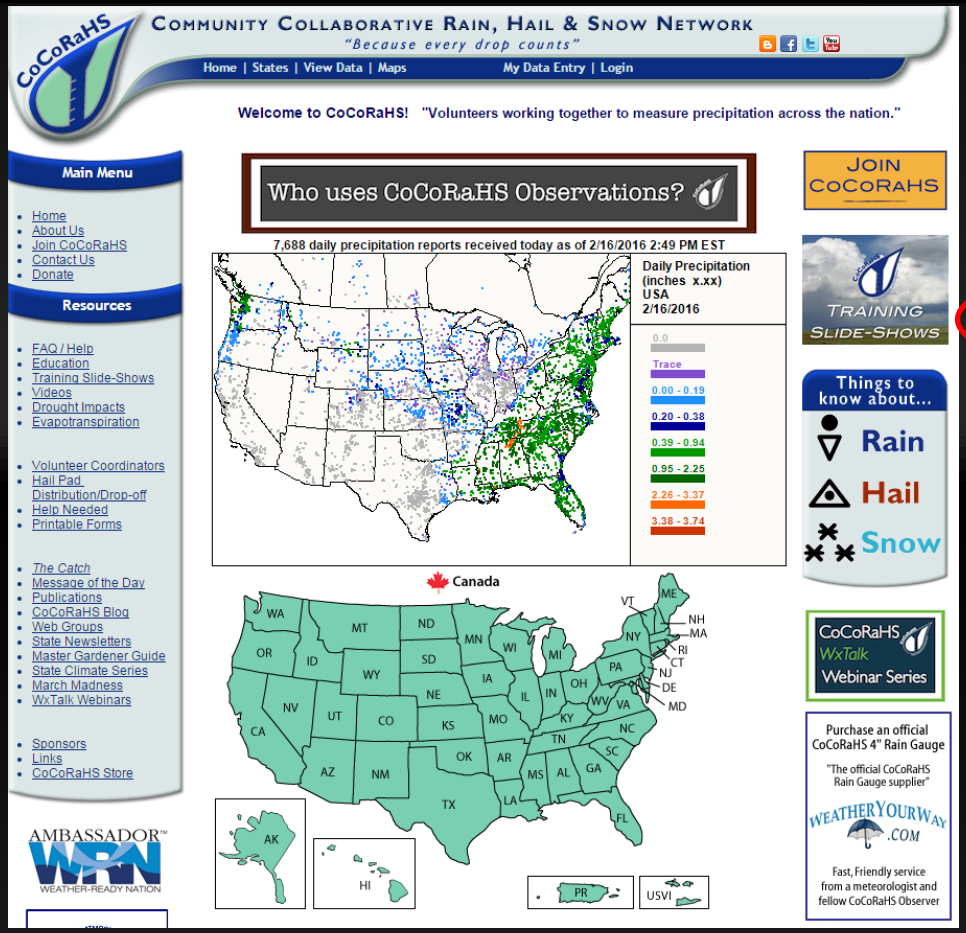
er Network

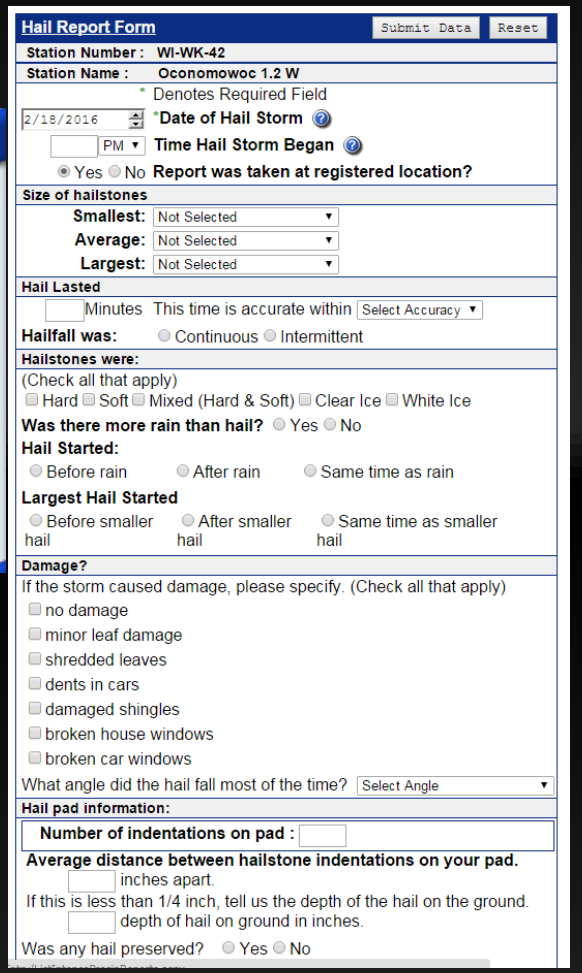


her Service Milwaukee/Sullivan

CoCoRaHS: cocorahs.org

Community Collaborative Rain, Hail, & Snow Network





How to report: Tornadoes

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX

- If safe, send picture via Twitter/Facebook
  - Could have a lag in communication
- Do NOT call 911!

- Stay in contact with office:
  - Is it still on the ground?
  - What direction is it from your location?
  - How confident are you in what you are seeing?
  - Any damage? If so, to what?
  - Contact information

How to report: Wall/Funnel Cloud

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX
- Send picture via Twitter/Facebook
- Do NOT call 911!

- Stay in contact with office:
  - Strong rotation?
  - Any debris under it?
  - What direction is it from your location?
  - How confident are you in what you are seeing?
  - Do NOT report scud or shelf cloud!

How to report: Wind Damage

Structural damage or uprooted trees?

- Call NWS Milwaukee directly: 1-800-545-8197
- Amateur Radio: WX9MKX
- Do NOT call 911!

Other damage for 40-70mph winds

- Send report/picture via Twitter/Facebook/Website
- Measured wind gusts are a plus!
  - Get a weather station!

- Is it a full tree that is down or just parts of it?
- Under 40mph or no damage? No need to report.

How to report: Hail

Over 2” (Lime) Diameter Hail?

- Call NWS Milwaukee directly: 1-800-545-8197
- Amateur Radio: WX9MKX
- Send report/picture via Twitter/Facebook/website/mPING
- Do NOT call 911!

Less than 2” Diameter Hail?

- Twitter/Facebook/website/mPING

- Take picture of largest hail stones in front of ruler or object

How to report: Flash Flooding

Roads washed out or closed. Rainfall rates of 3” per hour or more?

- Call NWS Milwaukee directly: **1-800-545-8197**
- Amateur Radio: WX9MKX
- Send report/picture via Twitter/Facebook/website
- Do NOT call 911!

- Measure rain and how long it fell.
- Urban flooding?

Flash flood damage from nearly 9 inches of rain overnight July 11/12, 2016 along HWY 13 in Ashland Co. near Highbridge, WI.

Safety

- Your safety is a #1 priority!
- It is your responsibility to stay safe
- Obey federal, state, local laws, and directives from public safety officials
- Do not put yourself (or others) in harms way

Safety

- Awareness
- Communicating whereabouts
- Escape Routes
- Safe zones/shelters


Thank you for attending!
Questions?
Timothy.J.Halbach@noaa.gov